

CLAIMS

WHAT IS CLAIMED:

1. A method of forming a metal layer over a patterned dielectric formed on a
5 substrate, the method comprising:

depositing a first material layer over said patterned dielectric in a gaseous deposition
atmosphere including, at least temporarily, a catalytic material; and

exposing said first material layer to a plating solution including ions of the metal to be
deposited, wherein said catalytic material incorporated in said first material
10 layer initiates a reaction to reduce metal ions and to form a metal layer on said
first material layer.

2. The method of claim 1, wherein said catalytic material comprises at least one
of platinum, palladium, silver, copper and cobalt.

3. The method of claim 1, wherein depositing said first material layer comprises
establishing said gaseous deposition atmosphere by sputtering atoms of said first material
and, at least temporarily, catalyst atoms off a target.

4. The method of claim 3, wherein said catalytic material is substantially
uniformly distributed in said target.

5. The method of claim 3, wherein said catalytic material is provided on one or
more distinct portions of said target.

6. The method of claim 1, wherein depositing said first material layer comprises establishing said gaseous deposition atmosphere by sputtering atoms of said first material off a target and supplying a precursor containing said catalytic material.

5 7. The method of claim 1, further comprising adjusting a ratio of atoms of said first material and of said catalytic material in said gaseous deposition atmosphere.

8. The method of claim 1, wherein depositing said first material layer comprises establishing said gaseous deposition atmosphere by supplying one or more precursor gases,
10 whereby at least one of said precursor gases includes said catalytic material.

9. The method of claim 8, further comprising controlling an amount of catalytic material incorporated into said first material layer by controlling at least one of a flow rate and a duration of supply of said catalytic material containing precursor gas.

15 10. The method of claim 9, wherein said catalytic material containing precursor gas is supplied after a predefined thickness of said first material layer is deposited.

11. The method of claim 9 or 6, wherein said catalytic material containing precursor gas is supplied after the deposition of said first material layer is discontinued.
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12. The method of claim 8, wherein at least two different precursor gases are supplied sequentially to deposit said first material layer in a digitally controlled manner.

13. The method of claim 1, wherein said first material layer comprises a barrier layer substantially preventing diffusion of said metal into substrate portions covered by said barrier layer.

5 14. The method of claim 1, further including forming a second metal layer over said metal layer by electroplating, wherein said metal layer acts as a seed layer.

15. The method of claim 1, wherein said metal layer comprises copper.

10 16. A method of forming a metallization layer, comprising:
depositing a catalytic material over surface portions of a patterned structure by at least one of chemical vapor deposition, physical vapor deposition, atomic layer deposition and plasma treatment; and
forming a metal layer above said patterned structure by electroless plating deposition
15 using a plating solution, wherein said catalytic material initiates a reaction between agents of said plating solution.

17. The method of claim 16, further comprising depositing a barrier layer on said patterned structure.

20 18. The method of claim 17, wherein said barrier layer is deposited by the same deposition technique as said catalytic material.

19. The method of claim 18, wherein said barrier layer is deposited by chemical vapor deposition, whereby at least at the end of the deposition of said barrier layer a precursor containing said catalytic material is present.

5 20. The method of claim 18, wherein said barrier layer is deposited by sputter deposition, whereby at least a portion of a sputter target comprises said catalytic material.

21. The method of claim 20, wherein a ratio of barrier material atoms and catalytic material atoms in a sputter deposition ambient is adjusted by selecting at least one of
10 controlling a density of said catalytic material in said target and controlling an exposed surface area of a target portion comprised of catalytic material.

22. The method of claim 18, wherein said barrier layer is deposited by sputter deposition, whereby a precursor gas containing said catalytic material is supplied during the
15 deposition of said barrier layer.

23. The method of claim 18, wherein said barrier layer is deposited by atomic layer deposition, whereby at least at the end of the deposition of said barrier layer a precursor containing said catalytic material is present.

20 24. The method of claim 17, wherein said catalytic material is deposited after the deposition of said barrier layer.

25 25. The method of claim 24, wherein said catalytic material is deposited without breaking the vacuum established during the deposition of said barrier layer.

26. A metallization structure in an integrated circuit, comprising:

a dielectric layer having formed therein an opening;

a metal filled in said opening;

wherein at least an interface between said metal and said dielectric layer comprises a catalyst including at least one of platinum, palladium, silver, copper and cobalt.

27. The metallization structure of claim 26, wherein said metal comprises copper.

28. A metallization structure in an integrated circuit, comprising:

a dielectric layer having formed therein an opening;

a metal filled in said opening,

a barrier layer formed between the metal and the dielectric layer;

wherein at least an interface between said metal and said barrier layer comprises a catalytic material including at least one of platinum, palladium, silver, copper and cobalt.